

Effective ICU Management of Postoperative Acute ARDS by Non-invasive Methods in a Rural Tertiary Care setup: A Case Report.

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Abstract:

Acute Respiratory Distress Syndrome (ARDS) is a severe, life-threatening lung condition that results from widespread inflammation and increased permeability of the alveolar-capillary membrane, leading to impaired gas exchange and respiratory failure. It can arise from various causes such as sepsis, pneumonia, trauma, or aspiration.

The Berlin Definition classifies ARDS based on timing, imaging findings, the origin of edema, and oxygenation levels, dividing it into mild, moderate, and severe forms. Despite advances in intensive care, ARDS remains associated with high morbidity and mortality. Management primarily focuses on lung-protective ventilation, fluid balance, and treating the underlying cause. Ongoing research continues to explore targeted therapies to reduce lung injury and improve outcomes. Early identification and appropriate supportive care remain crucial in reducing the burden of ARDS in critically ill patient.

Key words: Acute Respiratory distress Syndrome, Critical care, edema, fluid balance, lung protective ventilation

Introduction:

Acute Respiratory Distress Syndrome (ARDS) is a serious and often life-threatening condition in which the lungs become severely inflamed and filled with fluid, making it difficult for oxygen to pass into the bloodstream.^[1,2] First recognized in the late 1960s, ARDS continues to be one of the major challenges faced in critical care medicine.^[3] Rather than being a single disease, it is a clinical reaction that can develop from a range of causes, such as severe infections, sepsis, trauma, aspiration, or viral illnesses like influenza and COVID-19.^[2,3]

The Berlin Definition of Acute Respiratory Distress Syndrome (ARDS) was established in 2012 to provide a more precise and clinically relevant framework for diagnosis. It replaced the older American–European Consensus Conference (AECC) definition by refining diagnostic parameters and categorizing ARDS based on severity.^[1]

According to the Berlin Criteria, all of the following features must be present to diagnose ARDS: Timing: The respiratory symptoms must begin within one week of a known clinical insult (such as pneumonia, sepsis, or trauma) or show new or worsening respiratory symptoms within that time frame.^[3-6]

Chest Imaging: Bilateral opacities should be visible on chest X-ray or CT scan. These opacities should not be fully explained by effusions, lobar collapse, or lung nodules.

Origin of Edema: The respiratory failure should not be fully explained by cardiac failure or fluid overload. Objective assessment (such as echocardiography) is recommended to exclude hydrostatic pulmonary edema when no clear risk factor is present.

Oxygenation (Severity Classification): ARDS is further classified based on the $\text{PaO}_2/\text{FiO}_2$ ratio (partial pressure of arterial oxygen to fraction of inspired oxygen) while on positive end-expiratory pressure (PEEP) ≥ 5 cm H_2O : Mild ARDS: $200 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 300 \text{ mmHg}$, Moderate ARDS: $100 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 200 \text{ mmHg}$

Severe ARDS: $\text{PaO}_2/\text{FiO}_2 \leq 100 \text{ mmHg}$

Case:

A 27-year-old male patient came to emergency room with acute pain abdomen, Uncontrollable cough. All routine investigations, complete blood picture, liver function test, renal function test, coagulation profile, serum electrolytes done were within normal limits Ultrasound abdomen suggestive of acute appendicitis, electrocardiogram done, chest x-ray done and within normal limits.

Patient has been diagnosed with acute appendicitis with mild URTI. Patient has been taken for emergency OT, appendicectomy was planned, patient was induced under spinal anaesthesia and converted to GA as surgery time prolonged and midline incision was required. Surgery was intraoperatively uneventful with 50 ml blood loss, 2500 ml input and 450 ml output. Patient was stable post operatively, observed for 24 hrs and has been shifted to ward. Pod 5, patient suddenly developed respiratory distress with room air saturation dropping to 65% On 15 litres o_2 by face mask 83%. Patient has been shifted to sicu on 15 litres o_2 by face mask with vitals of PR –138 bpm, BP – 150/100 mmhg, SPO_2 – 83 % on 15 litres o_2 by facemask. Bilateral crepitation's on auscultation.

After discussing pros and cons of keeping patient on NIV ventilation in BIPAP mode, (i/v/o recent surgery and wound dehiscence) patient was taken on BIPAP with FIO_2 – 50%, PEEP 5CM, PS ABOVE PEEP 12 Cm H_2O , Inj.Lasix 20 mg iv given. Series of Chest xray and ABG done. (Fig 1&2, Table 1)

Minimal sedation with Dexmedetomidine was given when the PEEP was 12.

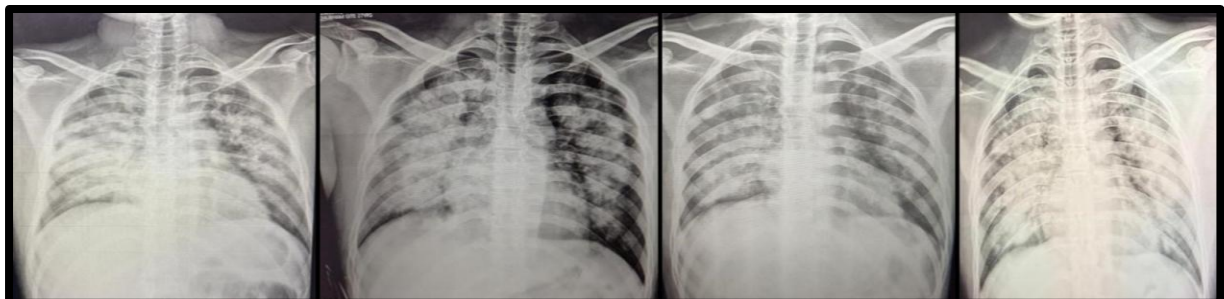


Fig 1: shows series of Chest x-ray changes over a period of time

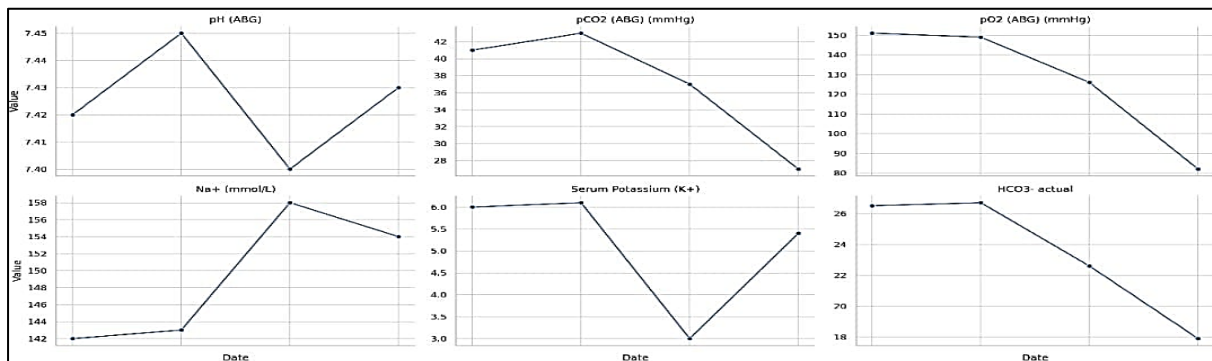


Fig 2: shows series of ABG values over a period of time

Test Parameter	Apr 16, 2025 - 9:07 AM	Apr 15, 2025 - 3:14 PM	Apr 15, 2025 - 2:24 AM	Apr 14, 2025 - 1:48 PM
pH (ABG)	7.42	7.45	7.4	7.43
pCO2 (ABG) (mmHg)	41	43	37	27
pO2 (ABG) (mmHg)	151	149	126	82
Na+ (mmol/L)	142	143	158	154
Serum Potassium (K+)	6	6.1	3	5.4
Calcium (mg/dL)	0.73	0.72		6.46
Glucose (mg/dL)	110	92	0.8	0.6
Lactate (Plasma)	1	1	0.8	0.6
Hematocrit (Hct) (%)	56.4	56	32	32
CaT+ (mmol/L)			2.5	1.9
HCO3- actual	26.5	26.7	22.6	17.9
HCO3- std			24	18.7
pCO2(37°C)			31.2	28.4
BE(ecf)			1.9	6.4
BE(act)			2.6	6.4
sO2c (%)			97	96
HbMARK			99	99

Table 1: shows series of ABG values over a period of time

HRCT showed bilateral ground glass opacities and consolidations with right side greater than left side. The ventilator settings are set as follows: Mechanical ventilator settings:

Day 1: Fio2 – 80%, PEEP 14 Cm H2o, Ps above PEEP 20 Cm H2o, **Day 2:** Fio2 – 60 %, PEEP 12 Cm H2o,Ps Above PEEP – 18 Cm H2o, **Day 3:** Fio2 – 45, PEEP 8 Cm H2o, PS above PEEP 12 Cm H2o, **Day 4:** Fio2 – 35 %, PEEP 5 Cm H2o, PS Above PEEP 10 Cm H2o, **Day 4:** second 12hrs, Patient was maintaining on 6 litres o2 by face mask, Day5 patient was maintaining saturation of 98%on 2 lit o2 by nasal prongs and 96%on room air. Patient was put on Injection Meropenem 1gm iv bd Injection Levoflox500 mg iv bd and tablet Fluvir75 mg bd.

Discussion:

Acute Respiratory Distress Syndrome (ARDS) represents a severe form of hypoxemic respiratory failure characterized by non-cardiogenic pulmonary edema and diffuse inflammatory injury to the alveolar–capillary membrane.^[1,2] The pathophysiology involves an

exaggerated inflammatory response resulting in increased capillary permeability, alveolar flooding, reduced lung compliance, and severe ventilation–perfusion mismatch. Although ARDS has been described for decades, its clinical course and outcomes continue to vary depending on the precipitating factor, timing of diagnosis, and effectiveness of supportive interventions.^[2,9]

In the present case, the patient fulfilled the Berlin criteria, demonstrating acute onset of hypoxemia with bilateral opacities not fully explained by cardiac failure.^[1,3] The progression of symptoms, radiological findings, and response to supportive ventilation aligned with the typical trajectory seen in moderate to severe ARDS. Early identification of ARDS is crucial, as outcomes improve significantly with timely application of evidence-based interventions. Lung-protective ventilation remains the cornerstone of management, with low tidal volumes (4–6 mL/kg predicted body weight) shown to reduce ventilator-induced lung injury, barotrauma, and mortality. In this case, initiation of low-tidal-volume ventilation contributed to gradual improvement in oxygenation parameters.^[4] Additionally, optimal PEEP settings helped maintain alveolar recruitment while preventing overdistension.^[5]

Several adjunctive therapies have been found beneficial in select patients. Prone positioning, for example, improves ventilation–perfusion matching and increases functional residual capacity. In moderate to severe ARDS, prolonged prone sessions have demonstrated mortality benefit. If applicable, the patient’s response to prone positioning can be highlighted as supportive evidence of best-practice management. Fluid strategy also plays a significant role in outcomes. Conservative fluid management, after initial stabilization, helps reduce alveolar edema without compromising perfusion.^[7] Similarly, neuromuscular blockade may be beneficial in early severe ARDS to enhance ventilator synchrony, although it remains selective to certain clinical scenarios.^[6]

The overall outcome in this case correlates with previous studies demonstrating that ARDS prognosis largely depends on disease severity, comorbidities, and timeliness of intervention.^[3,8,9,10] Although mortality remains high—especially in severe ARDS—advances in ventilatory strategies, sepsis management, and organ support have led to improving survival trends in recent years. This case reinforces the importance of early recognition, individualized ventilatory management, and a multidisciplinary approach in improving ARDS outcomes.^[3,4] The clinical course observed parallels current evidence, emphasizing that adherence to lung-protective strategies, fluid optimization, and timely adjunct therapies can lead to substantial clinical improvement even in severe presentations.^[4,9,10]

Conclusion:

Management of post op ARDS in non-invasive methods in tertiary rural setting is possible, provided adequate care ensured.

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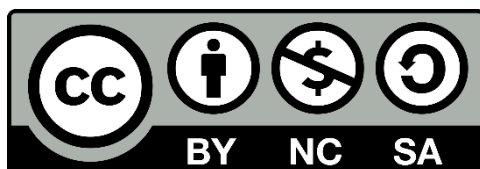
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